

## **Roadway Safety Improvement Program Detailed Description**

### **POLICY AND PROCEDURES FOR THE ROADWAY SAFETY IMPROVEMENT (RSI) PROGRAM**

#### **PURPOSE**

The purpose of this policy and procedures statement is to fulfill the requirements outlined in 23 CFR 924, Subchapter J, "Highway Safety Improvement Program." The overall objective on all Utah roads is to:

1. Reduce the number of accidents;
2. Reduce the severity of accidents;
3. Decrease the potential for accidents; and,
4. Make the most efficient use of available safety funds.

These objectives will be accomplished through identifying high accident locations and developing a program of roadway safety improvement projects to address those locations. Identified locations may be on any public roadway. Funding for the Roadway Safety Improvement (RSI) Program is apportioned under 23 U.S.C. 133(d)(1).

UDOT's RSI Program is an update to the previous UDOT HES Program.

#### **RSI PROJECT COORDINATOR**

The UDOT Engineer for Traffic and Safety, or designee, (The Engineer) shall be responsible for the implementation and coordination of the Roadway Safety Improvement Program. The Engineer and representatives from Utah Highway Patrol, Utah Highway Safety Office, local law enforcement, local government officials, UDOT Region Directors, UDOT Region Traffic Engineers, and the UDOT Traffic and Safety Division shall be included, as appropriate, as members of the RSI Team in each Region. The Engineer shall be the RSI Team coordinator, and is responsible for program development, project identification and review, development of the accident locations list, programming the funding, transferring proposed projects to design and construction phases in accordance with UDOT established procedures, and evaluation of the constructed RSI projects.

#### **RSI PROGRAM PROCESS**

##### **1. Collection of Crash, Traffic, and Roadway Data**

UDOT currently maintains a database that contains every reported accident that occurs within the state of Utah. The Central Accident Records System (CARS) database also contains roadway and traffic data for all state routes and federal-

aid routes. Roadway and traffic data for the database (the Roads File) is supplied and maintained by the UDOT Planning Division.

## **2. Identification of Safety Spot Locations (SSLs)**

The initial effort for identifying roadway safety improvement locations is to accumulate a list of SSLs throughout the State where the numbers of accidents and/or the severity of accidents are higher than expected, or where contributing circumstances are unknown. The process to assemble the SSLs is a two-step process:

- a. A statistical analysis of the CARS database is conducted to identify candidate accident locations. The statistical analysis is also conducted in a two-step process for roadway segments, and for roadway intersections.
  1. For roadway segments, a slider function (automated within the CARS database) is used to screen all roadway segments for those segments that reach threshold numbers of accidents within a 0.5-mile segment and 0.1-mile intervals.
  2. For intersections, the process is much more labor intensive. A screening for crashes within the CARS database at intersections is possible, but is very limited because of the format of the current Roads File. Essentially, all crashes that have been assigned an "intersection type" during the coding process will be queried, and the locations that reach a threshold number of crashes will be identified. Unfortunately, because of the Roads File, the database is unable to create an automated screened intersection report that includes all intersecting roadways at a given intersection. The crashes occurring on the intersecting roadway(s) will be summed manually to arrive at the final prioritized listing.
- b. Additional locations will be considered for addition to the SSLs as identified by UDOT Region engineers, other state agencies, the FHWA, the Utah Highway Patrol, local law enforcement, local government officials, and the general public.

The State of Utah contains 29 counties and approximately 231 cities. While it may not be feasible to personally contact 260 separate jurisdictions, the following strategies will be used to maximize participation of local jurisdictions:

1. Cities and counties with current US Census populations greater than 15,000 will be contacted annually via telephone and/or letter to solicit high accident locations and to provide education on the RSI program. According to the 2000 US Census, the 15,000 threshold will result in 30 cities and 15 counties being contacted annually.
2. Efforts to reach the rest of the cities and counties will focus primarily on partnering efforts with the Utah League of Cities and Towns. Annual participation in the Utah League of Cities and Towns' Road School is one particularly effective way to reach multiple jurisdictions. The process of reaching and involving local jurisdictions will be continually refined.

- c. The deadline for submission of locations to the Engineer for inclusion in the SSL lists is October 1<sup>st</sup> annually in order to be considered for programming in the current year's STIP process.

### **3. Selection of Locations for Preliminary Analysis**

Candidate locations on the SSLs are prioritized and selected for preliminary analysis using weighted accident rates, GIS plot maps, and collision diagrams. This selection process follows the following steps:

- a. Three year accident GIS plot maps and/or computer generated lists by county summarizing accidents on all roads and streets are prepared.
- b. Accidents for each location are equated to property damage accidents using a severity rating to determine weighted accidents. The following factors are used:
  - 1. One fatal accident equals twenty property damage accidents.
  - 2. One injury accident equals five property damage accidents.
  - 3. The average annual daily traffic is used to determine weighted accident rates.

These factors are used to rank and prioritize the candidate locations on the SSLs for further analysis.

- c. Detailed accident summary reports are obtained for each location for the most recent three-year period using the CARS database. The nature of the crashes is analyzed to determine if there are any apparent crash patterns.
- d. Each location is compared to UDOT's 5-yr STIP to ensure coordination between the two programs. Potential RSI projects within the boundaries of a project on the STIP will be advanced in this process, but funding will be determined on a case-by-case basis. Whether or not the potential RSI project is funded, the safety information developed will be provided to the Region for use in the development of the STIP project.
- e. Collision diagrams are prepared for each selected location.
- f. Potentially hazardous locations may be selected and ranked based on a comparison to locations that displayed characteristics similar to those at improved locations before safety improvements, and resulted in documented accident reduction after the improvements.
- g. An investigation file is prepared for each selected location, which includes data noted in a. through e. above.

### **4. Field Inspection of Individual Locations**

An on-site inspection or a review by video-log is made of each selected location by the RSI team. The reviews focus on the highest-ranked locations first. The timeframe to complete a review on every location in each SSL will be dependent on the availability of the RSI team members.

- a. A preliminary determination of the cause of the accidents at each location is made and possible mitigation measures are identified, both pending further investigation.
- b. Observations are made regarding sight distance, approach speeds, conditions of roadway surface, geometrics, lighting, existing traffic control devices, driver behavior, and other pertinent features.
- c. People living or doing business in the immediate area are occasionally contacted regarding their observations of what might be contributing to the accidents.
- d. A Location Reviews Report is by the Engineer to summarize the problem, mitigation discussed, and preliminary recommendations for all sites inspected. The report is sent to the inspection team members, FHWA, and Region Directors.
- e. The Location Reviews Report may recommend that a location is not appropriate for the RSI program, but the report may identify other methods for dealing with a problem at a given location.

**5. Selected Locations Analyzed, Corrective Action Proposed, and Listing Prepared**

Using the investigative file and Location Review Report, each location identified is analyzed, corrective action proposed and a final priority listing prepared by the Engineer.

- a. A list is developed which includes the location, the proposed improvement, a cost estimate for the improvement, and the benefit/cost ratio for each location.
  - 1. The Equivalent Uniform Annual Cost (EUAC) of the proposed improvement is calculated by the Engineer using an interest rate and a design life based on the current economy and the improvement selected. UDOT's "Quantities and Average Low Bid Unit Prices" listing will be the basic source for estimating the cost of each improvement.
  - 2. The Equivalent Uniform Annual Benefit (EUAB) of the proposed improvement is calculated by the Engineer using the Bailey Method Attachment to FHWA Technical Advisory T7570.1 (modified), and current accident costs as determined by FHWA Technical Advisory T7570.2 dated October 31, 1994, and subsequent updates. Accident Reduction Factors (ARF) used to calculate the reduction in accidents associated with a given improvement are taken from the following sources:
    - a). FHWA
    - b). Kentucky Transportation Center, "Development of Accident Reduction Factors" (Research Report KTC-96-13, June 1996)

The Kentucky ARF Study used a comprehensive survey of 44 states and a literature review of 61 documents to determine the best estimates of reduction factors for given safety improvements. As more data becomes available, UDOT will eventually develop a localized database for Utah using actual reduction factors resulting from constructed RSI projects. Until that time, the Kentucky ARF study is the best information available.

3. The Engineer determines the benefit/cost ratio for each location by dividing the calculated Equivalent Uniform Annual Benefit (EUAB) resulting from the improvement by the calculated Equivalent Uniform Annual Cost (EUAC) of making the improvement. The locations with benefit/cost ratios of less than one are not included in the list of recommended Roadway Safety Improvement projects.
- b. The Engineer reviews the proposed projects, reviews the intended improvement(s), and prioritizes the proposed projects based on the following factors.
  1. Costs
  2. Benefits
  3. B/C Ratio
  4. Plan Development Schedule
    - a). Survey
    - b). Utilities
    - c). R.O.W.
    - d). Design Schedule
  5. Coordination with other programmed UDOT projects.
  6. Allocation of a portion of apportioned funds to areas of the State as defined by current UDOT Region boundaries and the type and number of accidents occurring in each.
- c. The proposed RSI program, with cost estimate and benefit/cost ratio, is presented for review at the annual Region Statewide Transportation Improvement Program (STIP) workshops (usually held in January).
- d. Following the Region STIP workshops, the recommended program of RSI projects is submitted to the Transportation Commission for review and approval as part of the STIP.

## **6. Implementation**

The scheduling and implementation of RSI Projects shall be in accordance with procedures set forth in 23 CFR (ie. Parts 630 and 635) and the following:

- a. For each RSI project in the STIP, UDOT Region Directors shall be responsible for assigning a project manager, for obligating federal funding, for developing the design, and for advising the Engineer of the progress and status of each project.
- b. The UDOT Region Project Manager shall be responsible for the timely completion of the projects they are assigned. When applicable, this shall include, but not be limited to design plans and specifications, environmental studies, funding agreements, maintenance & non-encroachment agreements, coordination of right-of-way acquisition, utility agreements, and delivery of final plans to UDOT Construction Division, Contracts, Estimates and Agreements Section for advertisement.
- c. The Project Manager shall involve the FHWA, the Engineer, and other representatives of the Traffic and Safety Division in the development of each project in an advisory role.

**7. Evaluation**

Three years after construction of the improvement is completed, the Engineer will evaluate each Roadway Safety Improvement project based on a comparison of accidents three years prior to the improvement to three years following the improvement. The comparison will be made for accident numbers, accident rates, and accident severity. The evaluation process is similar to the process for determining the estimated benefit-cost ratio described in Section 5, except actual costs and actual savings are used.